Operating Instructions

SMC

Version 1.5

Date: 02.02.2005

PUBLICOUNT

Trade Name: Publicount
Model No: SENSOR

FCC ID: SFH PC0001

IC: 5288A-PC0001

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions. (1) this device my not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by ***Publicount*** may void the FCC authorization to operate this equipment.

Summary description of the Publicount SMC

- People counting system
- Storage and transmission of customer traffic data

- Aluminium housing, approx. dimensions 170 x130 x70 mm
- Approx. weight 1000g
- Mains input 100..240V AC / 50..60Hz via external 12V DC power supply unit
- Power consumption max. 30 Watt

- 30-day cycle memory
- Connection of up to 12 Publicount sensors
- Up to 32 data SMCs on one RS-485 bus

- Firmware update to SMC firmware possible in site

Summary description of firmware versions:

1.1. Replacement firmware for HUZ2 versions PCHUZ 60, 61, 90, 91
with boot-loader (RS232)

Sensors: KF 32.x

Contents:

1. Introduction

Publicount is a contact-free people counting system based on radar technology to determine customer traffic in a shopping centre or in certain areas of a shopping centre.

To do this, sensors are installed above the relevant access points. These send physical measurement data to a data-logger, also called sensor management centre or SMCs, also installed in the entrance area.

The SMC evaluates the numbers of people entering and leaving and assigns the people counts to the time of day. Customer traffic data are stored in the SMC for the last 30 days.

A number of these SMCs are linked to a PC which stores customer traffic data on a long-term basis and allows further processing in graphic or tabular form.

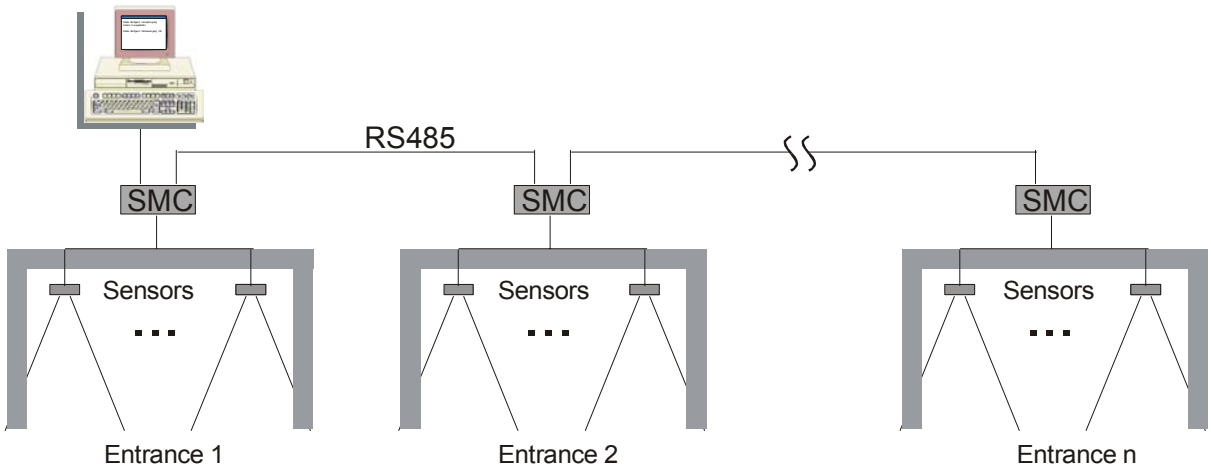


Fig1-1 System block diagram

These operating instructions contain information on

- assembly of the counting equipment (positioning and cabling of the SMCs and sensors)
- configuration of the counting equipment (operation of all firmware versions)
- firmware updates for the counting equipment (SMCs and sensors).

Warning: ***Failure to follow the guidelines for the assembly and cabling of sensors/SMCs described in these operating instructions may result in damage to the equipment!***

2. Assembly of sensors

This chapter describes how the sensors have to be projected (location of projection fields, number of sensors to be installed) and how the sensors are connected to the SMC (connector assignment).

The sensors are integrated into the ceiling or into cable channels or suspended directly from the ceiling.

Warning: ***Sensor mountings must be insulated for correct operation. The sensor should not have any contact with other electrical power circuits, e.g. the earth circuit. Failure to comply with this instruction may result in damage to the sensor.***

2.1. The size of the projection field

The following illustration shows the projection surface of the sensor field.

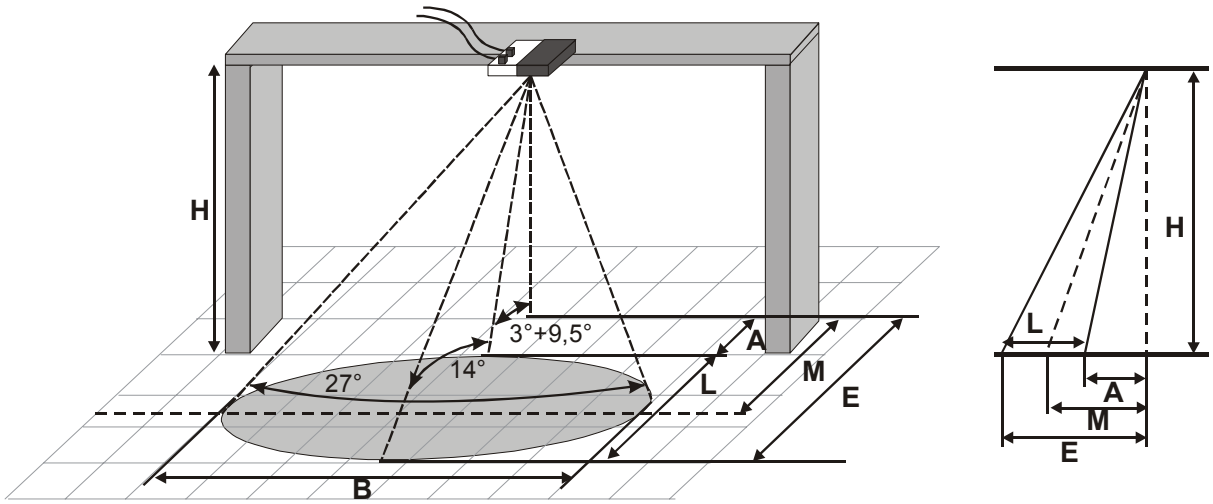


Fig. 2.1-1 Projection surface of the sensor

H = Sensor installation height

A = Beginning of sensor field
L = Length of sensor field
E = End of sensor field
M = Distance to the centre of the sensor field

The size of the projection field is calculated as follows:

$$A = H \tan(12.5°) = \frac{H}{4.5}$$
$$M = H \tan(19.5°) = \frac{H}{2.8}$$
$$E = H \tan(26.5°) = \frac{H}{2}$$
$$L = E - A$$

B = Width of sensor field

$$\frac{B}{2} = \frac{H}{\cos(19.5°)} \tan(13.5°) = \frac{H}{3.9}$$

People are counted as they cross the centre line (distance M).

The following table shows the parameters of the projection field for different installation heights:

H / m Height	A / m Beginning	M / m Centre	E / m End	L / m Length	**B_{floor} / m** Width on the floor	**(B_{1m}/2) / m** Width at 1m height
2.8	0.62	0.99	1.40	0.78	1.42	0.92
3	0.67	1.06	1.50	0.83	1.52	1.01
3.2	0.71	1.13	1.60	0.89	1.64	1.12
3.4	0.75	1.20	1.70	0.94	1.74	1.22
3.6	0.80	1.27	1.79	1.00	1.84	1.32
3.8	0.84	1.35	1.89	1.05	1.94	1.42
4	0.89	1.42	1.99	1.11	2.04	1.52

Size of the sensor field for different installation heights

It should be noted that these parameters do not represent definite lines (the projection field is simply weaker here).

Note:

The parameters given above refer to an intensity drop of 3 dB. The following angles apply for other intensity levels:

Intensity drop	Width (B)	End (E)	
3dB	27°	26.5°	Innocent specification
5dB	38°	(23+3)°	From directional characteristic
10dB	64°	(30+3)°	From directional characteristic

2.2. Number of sensors to be installed

The number of sensors to be installed depends on the firmware version of SMC used.

2.2.1. SMC Firmware 1.x

The number of sensors to be installed depends on the installation height and the width of the section to be covered.

The distance between the sensors is **installation height / 3**. The distance between the wall and the outside sensors is **installation height / 6**.

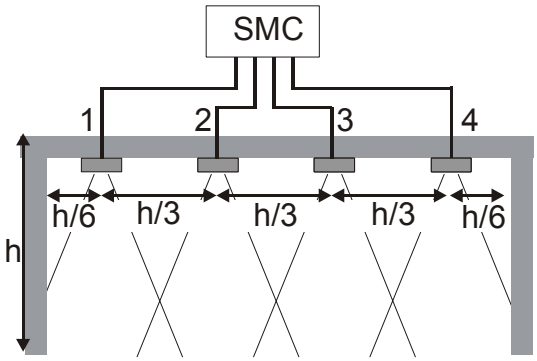


Fig. 2.2.1-1 Distance between sensors

There should be a deviation of no more than 5% from this parameter.

2.3. Position of the projection field

For correct operation, the sensors must be projected in such a way that

- there are no moving parts within the sensor field, such as:
  - entrance doors which swing through the sensor field
    exception: glass doors without metal gridding
  - escalators, fans

- there are no people present in the sensor field for long periods, e.g.
  - if there are goods located within the sensor field which the customer walks around a number of times and so is counted more than once
  - if queues form here.

- the construction on which the sensors are mounted is vibration-free.

In addition the following points must be taken into account with respect to the position of the projection field:

- If the projection field lies too far inside the shop there is the likelihood that people will remain within the projection field for a considerably longer time (they come in and then think first of all about where they want to go / goods displays in the vicinity of the entrance area / ...).

- If the projection field lies too far out it is possible for people to be counted who have not entered the shop (looking in from outside and then going away again / walking outside along the line of the sensor field / ...)

- If the entire entrance area is not covered, then people can walk in such a way that they do not cross the counting area (see Fig. 2.3-1)

- The projection field should not be directed at metal flooring elements (if the store is in the construction phase, mats can be used which do not contain any metals)

Getting the projection right is crucial for later adjustment. If the projection is poorly set up, a counting accuracy of 95% can only be achieved with a very great deal of adjustment, or possibly not at all.

If the client wishes the sensors to be positioned differently (e.g. for optical reasons), it must be pointed out that this means that a counting accuracy of 95% can no longer be guaranteed.

A few examples of the position of the projection field are given on the next page.

The following illustration shows the entrance of a store (the dark rectangles represent the wall where the entrance ends). For counting to be correct, the projection fields must be arranged to that their centre line covers the entire entrance area.

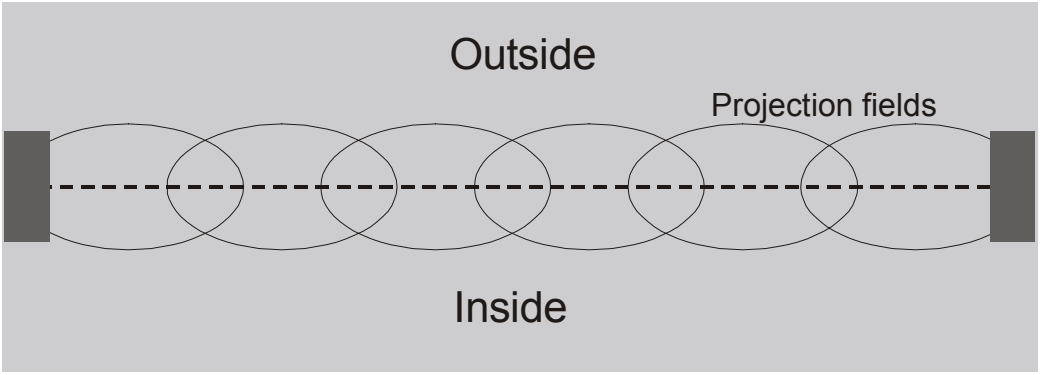


Fig. 2.3-1 Position of projection fields at the entrance

All sensors in this entrance area are to be given the same entrance number in the configuration assignment (e.g. all entrance 1).

In the following illustration, the entire entrance area is not covered, which means that people can walk in such a way that they do not cross the counting area.

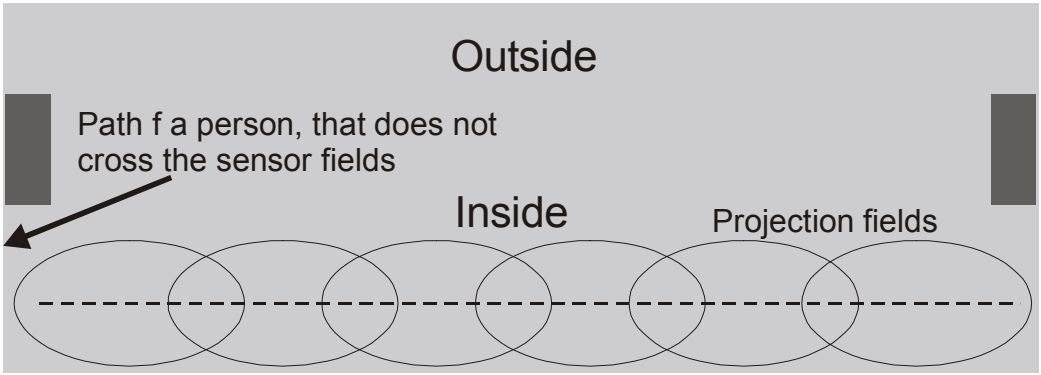


Fig. 2.3-2 Position of projection fields at the entrance – Poor projection

If the entrance is divided by a pillar, for example, as shown in the following illustration, then the sensors are assigned to the different entrances.

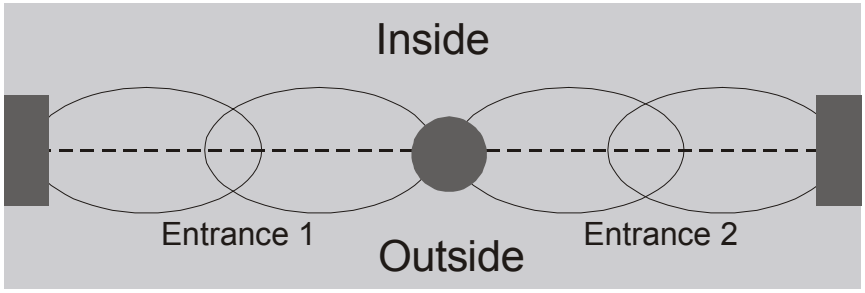


Fig. 2.2-3 Position of projection fields in an entrance with pillar
[Innen = Inside, Aussen = Outside, Eingang = Entrance]

2.4. Floor markings

With some installations, floor markings are applied which mark the area where no goods should be displayed to the customer. The following illustration shows the area which must be kept free:

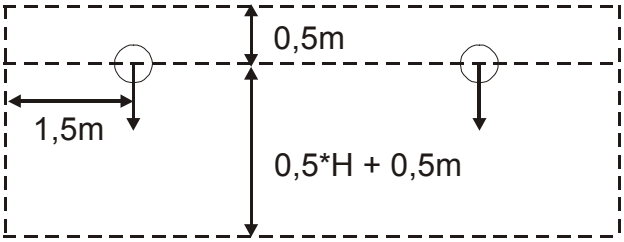


Fig. 2.4-1 Area which must be kept free for accurate counting

The markings are applied at the corners of the free area in each case.

2.5. Connector assignment

Each sensor is connected to the SMC via a 6-core, flexible shielded ..... cable.

A shielded 8-pin RJ45 connector is used on the SMC side and an unshielded 6-pin RJ45 connector is used on the sensor side. The shielding is applied on one side of the SMC.

Warning: ***If the shielding is applied to both sides, this may result in damage to the sensor.***

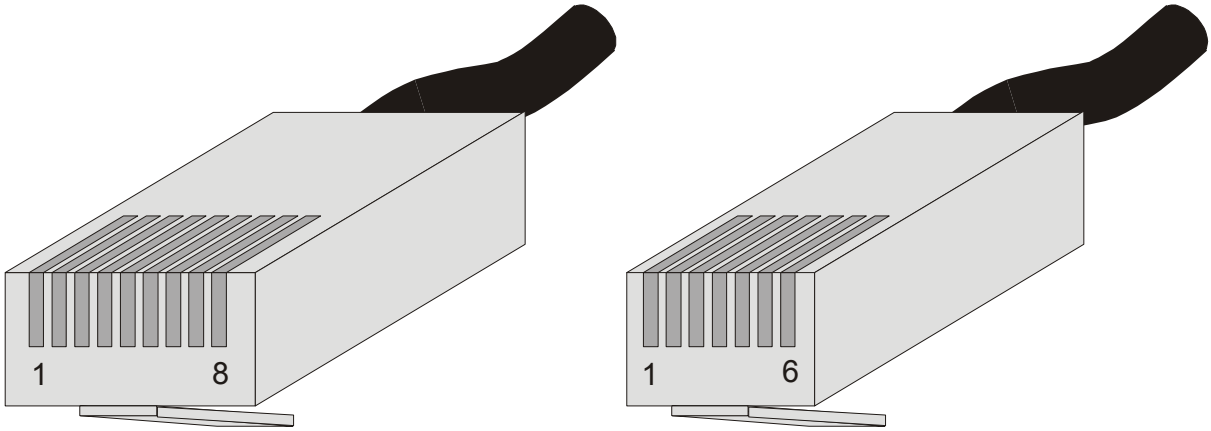


Fig. 2.5-1 RJ45 connector, 8-pin / 6-pin

Connector assignment:

RJ45 – 8-pin	SMC	Sensor	RJ45 – 6-pin
1	Shielding		
2	Gnd	Gnd	1
3	Gnd	Gnd	2
4	RS485 – B	RS485 – B	3
5	RS485 – A	RS485 – A	4
6	U+	U+	5
7	U+	U+	6
8	Shielding		

The RJ-45 sockets of the SMC also have contact lugs for shielded RJ-45 connectors, so that, as an alternative, the shielding can also be applied to the connector housing instead of pin 1 and pin 8.

The LEDs on the RJ-45 sockets of the SMC come on when a data transfer with a sensor occurs on the corresponding port or this is attempted on the part of the SMC.

2.6. Connection of sensors to the SMC

The sensors have a star connection with the SMC.

In order to simplify servicing the sensors are numbered as follows:

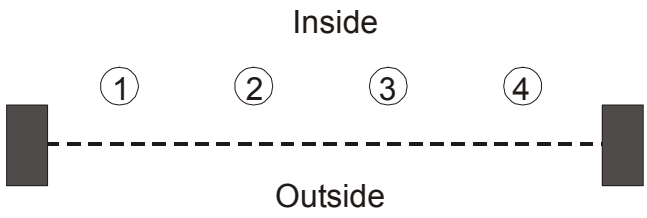


Fig. 2.6-1 Numbering of sensors

Looking into the shop from outside, the sensors are numbered from left to right.

3. Connecting SMCs together

If a number of SMCs are required in order to cover all the entrances and/or access ways in a store, these are to be connected via the RS485 data bus in a ring line open on one side.

Cable ..... is used, as with the connection of the sensors.

The shielding is connected on one side of the cable with the shielding of the modular connector.

Warning: ***Applying shielding to both sides may result in communication errors and, with the HUZ2(b), also to damage to this.***

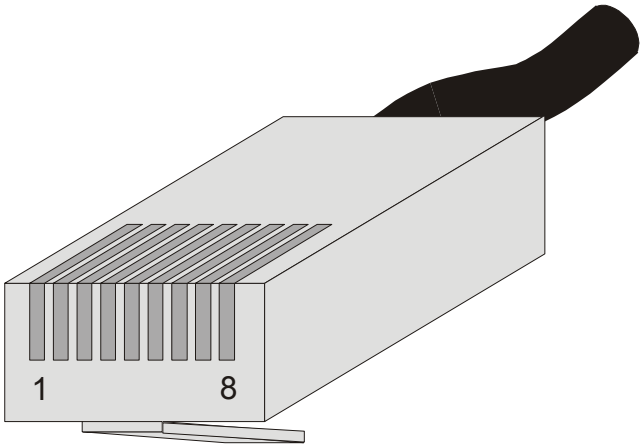


Fig. 3-1. RJ45 connector, 8-pin

Connector assignment:

RJ45 – 8-pin	SMC
1	
2	
3	
4	RS485 – B
5	RS485 – A
6	
7	
8	

4. PC, Modem, Com Server

Results are displayed and counting data are stored long-term on a PC. For this purpose, PUBLICOUNT GmbH offers Publicount Soft and Publicount View software.

The RS485- Ports of the SMC are supposed for the data request. The RS232- Ports are supposed for User Configuration of the SMC, maybe with use of a Bluetooth-Module. So the SMC initialises a Bluetooth Module after Power On. A Modem connected to RS232 will loose its Configuration in case of this initialisation.

4.1. End equipment connected to the RS232 port of a single SMC

This option should only be considered for small units with just one SMC and a maximum line length of 20 m between SMC and PC.

For this, the SMC must be also positioned next to the end equipment.

Option 1: PC and SMC are connected via a standard zero modem cable. The data connection to the SMC is via the RS232 port. An additional 230 V connection must be available for the PC.

Option 2: Ethernet server and SMC are connected with a standard zero modem cable. The data connection to the SMC is via the RS232 port. An additional 230 V connection and the Ethernet connection / modular RJ45 must be available for the server. Both connections to the Ethernet server are plug connections.

Option 3: Modem and SMC are connected over a RS485 Converter. The data connection to the SMC is via the RS485 port. An additional 230 V connection and an analogue telephone connection must be available for the modem. Both connections to the modem are plug connections.

Fig. 4.1-1. Modem connected to SMC

4.2. End equipment connected with the RS485 bus for more than one SMC

This option must be adopted when a number of SMCs are used.

For the sensors, cable ..... should be run from a free bus connection on the first SMC to the end equipment in position.

The bus is connected to the RS485 converter in the usual way here.

The RS485 converter has a 9-pin SUB-D plug as its RS232 data connection. The end equipment is connected to it as already described in the previous section.

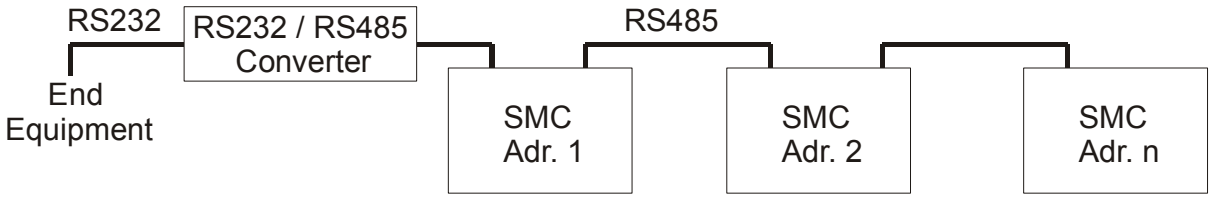


Fig. 4.2-1. End equipment connected to more than one SMC

The RS485 converter does not need its own 230V connection. Power is supplied to it from the connected SMC and for this reason the bus line between SMC and converter must be a 4-core line (connector arrangement the same as the connection lines between SMC and sensors). Cable shielding is provided on both sides.

5. Operating the SMC

A terminal programme is required for operating the SMC.

The connection between PC and SMC can be produced via a zero modem cable to its RS232 interface or, optionally via Bluetooth.

With Bluetooth, the stages described in Appendix A4 must be followed in order to make a connection.

5.1. Terminal settings

The HyperTerminal supplied with Windows, for example, is suitable as the terminal programme. This is found under

Start – Program Files – Accessories– Communication - HyperTerminal

The settings are:

Baud rate	9600
Data bits	8
Parity	none
Stop bits	1
Flow control	none

In addition, under

Start – Setting – System control - Keyboard

the delay must be set to short and the repeat rate to high.

5.2. General operation

The following commands function independently of the SMC firmware and SMC being used. In contrast to the HUZ2, the two ports (RS232, PC) are separate in the SMC, i.e. there are no outputs over RS485 during the configuration of the SMC via RS232. Therefore data may be called up by the PC over RS485 parallel to configuration.

5.2.1. Interrogation into SMCs connected

If key 'a' is depressed for 2-3 seconds, the connected SMC responds with the message

```
HUZ3 Version 1.1 = PCHUZ91 English - Address 1
```

This gives the firmware version, language and address of the SMC. The address is set to 1 at the factory.

In the example	Firmware version	1.1 = PCHUZ91 (emulated version)
	Language	English
	Address	1

If a number of SMCs are connected to the RS485 bus, this cannot be interrogated with 'a'.

5.2.2. Activating the SMC

The SMC is activated as follows:

1. Hold key '0' down for 2 - 3 seconds
2. Enter the address of the SMC (e.g. 1 for address 1)
3. Confirm input with Enter

The response by the SMC contains additional operational options, e.g. start a control count.

5.3. Firmware 1.x

Firmware version 1.x represents the replacement firmware for HUZ2 versions 60, 61, 90 and 91.

For operation the sensor versions RN-SE2, KF or KF32.x are required.

All points of the HUZ2 firmware are contained in this, under other names. In contrast to the HUZ2 versions, the SMC differs in the following points:

- in-counts / - people / ... renamed as „Counts in“ / "Person in“ / ...
- out-counts / - people / ... renamed as "Counts Out“ / Person out“ / ...
- The "Demo Modus“ has been renamed "Control Counting“ and is selected using key 'c'. As up to 12 inputs are possible, the entrances to be displayed can be selected by key 'd' (Display Entrance).
- The "Test Modus“ has been renamed "Live Mode“ and is activated with key 'l'.
- "Basic settings" and "Assignment" have been brought together in a configuration menu which is opened with key 'c' (Configuration Menu). This menu also displays the firmware version of the sensors. The operation of this menu is described below.
- The SMC has a Bootloader, by means of which it is possible to update the SMC firmware.
- All parameter inputs (e.g. address) can be interrupted with ENTER or ESC.

The following remain the same:

- Connected SMCs are interrogated with key 'a':
- Activate the SMC by keeping key '0' depressed (approx. 2 seconds), then enter the SMC address and confirm with ENTER.
- Auto-test is still selected using key 's'. All data stored are lost with the auto-test.

In the text below there is first a description of the setting parameters of SMC version 1.x, with their meanings. Then the operation of the SMC is described.

5.3.1. Sensor measurement data, counting parameters of the SMC

If a person crosses the sensor field, the following measurement data are produced:

```
 1:   a  0    i 0     o 0
 2:   a 32    i 5     o 0
 3:   a 63    i11     o 0
 4:   a 75    i19     o 0
 5:   a 96    i31     o 0
 6:   a116    i41     o 0
 7:   a115    i48     o 0
 8:   a125    i48     o 0
 9:   a 18    i 0     o 0
10:   a 17    i 0     o 0
11:   a  0    i 0     o 0
12:   a  0    i 0     o 0
```

Each line represents a period of 140ms.

In the first column (a) is the amplitude measured (signal strength), in the second (i) and third (o) the number of counts measured for In and Out directions.

Counts are path impulses and contain directional information. By crossing the sensor field a person always produces approximately the same number of path impulses.

These impulses are evaluated and added as soon as they reach a certain signal strength (amplitude > 10). Therefore this value is dependent on the ***Gain*** amplitude set.

If the counts measured exceed the threshold value set for ***Counts In***, ***Counts Out***, then a person is counted.

In the example a person crosses the sensor field in the In direction.

The setting parameters should be such that 50..50 counts are measured for a person of average size. If fewer counts are measured, the amplitude should be increased. If more counts are measured, the amplitude should be decreased.

Group Delay parameters give the measurement period after the count threshold has been exceeded. As counting behaviour, especially with a number of people (groups), is affected by this, this parameter is referred to as Group Delay.

e.g.: Counts In = 40 , Group Delay = 2

> In the example above, the threshold in line 6 (a116 i41 o0) is exceeded. The measurement of this person is now ended after 2 lines (Group Delay –setting).
>
> The next measurement of a person can then start.

With a low Group Delay value, more people are counted overall. However, the counting accuracy for individual people deteriorates.

With a high Group Delay value, fewer people are counted overall, but the counting accuracy for individual people is better.

Collection of counting parameters

The following parameters are set separately for each sensor:

Gain	sensor amplification setting
Counts In	threshold value for counting one person In
Counts Out	threshold value for counting one person Out

The following parameters are set once for all sensors:

Group Delay Sensor	group delay under one sensor
Group Delay Mid	group delay between two sensors

5.3.2. Additional setting parameters

The following setting parameters exist for the SMC V1.x:

HUZ Address — Address of the SMC on the RS485 data bus

HUZ Version — The HUZ2 version to be emulated. The versions differ as follows:

Numbers of people:

60, 90 — The counts are added together over the entire signal for one person.

61, 91 — The counts are only added while the signal for one person increases.

Data call-up

60, 61 — 8 bit format for data call-up. PC software Publicount PCSoft 6.1x is required

90, 91 — 16 bit format for data call-up. PC software Publicount PCSoft 6.2x is required.

The following setting parameters exist for the sensors:

Entrance — The entrance to which the sensor is assigned. The SMC can handle up to 12 entrances here.

Sensors monitoring the same entrance must also be given the same entrance number.

Sensors monitoring different entrances must be given different entrance numbers.

Reverse: — Inverting the direction of travel.

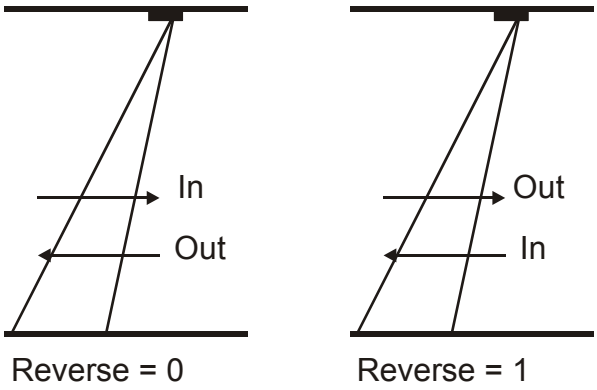


Fig. 5.4.2-1 The meaning of the reverse setting

If Reverse = 0, then people going into the sensor only are counted.

If Reverse = 1, then people going out of the sensor only are counted.

5.3.3. Live Mode

In Live Mode the measurement data of the individual sensors are displayed. This is started after the activation of the SMC (see 5.3.2) by pressing key 'l'. The SMC then responds as follows:

```
_____________________________ LIVE MODE _____________________________________
<r> Reset of already counted persons
<c> Configuration menu
<d> Display sensor
<e> End
```

The commands possible are displayed here, a brief description of which follows:

r	Reset people already counted
c	Call-up the configuration menu
d	Select sensors displayed, e.g. 1 for sensors 1&2
e	End Live Mode

The measurement data from the sensors are issued as follows.

```
a  0  0  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  0  0  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  0  0  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  0  0  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  0  0  2  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  1  1  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
a  1  1  1  ic  0  0  0  ip  0  0  0  oc  0  0  0  op  0  0  0
```

Each line represents a period of 140ms. The measurement data are:

a	Amplitude
ic	Counts In
ip	Person In, number of people counted In
oc	Counts Out
op	Person Out, number of persons counted Out

In each case 2 sensors and an imaginary sensor located between the sensors are displayed. This latter counts people passing between 2 sensors.

The measurement data for the imaginary sensor are calculated as follows:

Amplitude	= Amplitude of first sensor	* Amplitude of second sensor
Counts In	= Counts In of first sensor	+ Counts In of second sensor
Counts Out	= Counts Out of first sensor	+ Counts Out of second sensor

Counts are added as from an amplitude of 30.

If amplitude "---" is issued, communication with the sensor has failed. In this case the cable connection to the sensor should be checked.

5.3.4. Control Counting

Under "Control Counting" the people counted per entrance are listed. Control counting is started after activation of the SMC (see 5.3.2) by pressing key 'c'. The SMC then responds as follows:

```
_____________________________ CONTROL COUNTING _____________________________
<r> Reset of already counted persons
<c> Configuration menu
<d> Display entrance
<e> End

EN 1 i   0 o   0  EN 2 i   0 o   0  EN 3 i   0 o   0  EN 4 i  0 o  0
```

The commands possible are displayed above:

r	Reset people already counted
c	Call up the configuration menu
d	Select entrances displayed (EN), e.g. 1 for entrance 1...4
e	End control counting

Underneath, the people counted are displayed:

EN	Entrance	
i	People In	= number of people counted in
o	People Out	= number of people counted out

5.3.5. Automatic Calibration

Behind "Automatic Calibration“ there is an installation assistant to determine counting parameters. This calls up all the setting parameters of the SMC and the sensors. The counts are set automatically - in which each sensor is crossed 7 times per direction.

Automatic calibration is started after the activation of the SMC (see 5.3.2) by pressing key 'a'. The SMC responds as follows:

```
____________________ AUTOMATIC CALIBRATION ____________________________
<l> Delete last displayed value
<n> Next sensor
<e> End

HUZ address           1 (1..32)=
```

First the address of the SMC on the data bus is requested. If this is entered, or skipped (ENTER or ESC), additional parameters are requested. After parameter interrogation, the following is displayed on the screen:

```
Sensor  1
Assign sensor to entrance:     1 (1..12)=
Reverse                        0 (0..1)=
Gain                          50 (5..100)=
runs needed 7    in:  0  0  0  0  0  0  0 out:  0  0  0  0  0  0  0
```

For automatic calibration, "Sensor 1" must be crossed seven times is each direction. Each measurement value (Count) is given in the bottom line. The last value measured can be deleted by pressing key 'l’. When calibration of the sensor is finished, the SMC responds with

```
counts in= 43
counts out= 46
Save values? 1: (0..1)=
```

If a '1' is now entered, the new parameters are saved. Pressing a '0' rejects the new parameters.

By pressing key 'n' (Next Sensor) the sensor is skipped.

If no sensor is connected to the present sensor port, „`Sensor 4 Not Connected`“ is displayed.

5.3.6. Configuration Menu

All setting parameters for the SMC and the sensors are displayed in the configuration menu.

The configuration menu is called up from "Live Mode“ or "Control Counting“ by pressing key 'c'. The SMC responds with:

```
_____________________ CONFIGURATION MENU ________________________________

Enter password: (18)
```

At this point the password must be entered (18) and confirmed with Enter in order to go into the menu. The SMC responds with:

```
_____________________ HUZ3 Version 1.1 English ____________________
Date: 8.9.2004 , Time: 21:15 , Serial:HUZ3-0408-002

Sensor  Version EntranceReverse  | Gain    CountsIn CountsOut
< 1>    32.3     1      0        |  50     35       35
< 2>    32.3     2      1        |  50     35       35
< 3>    NC      Not Used
< 4>    NC      Not Used
< 5>    NC      Not Used
< 6>    NC      Not Used
< 7>    NC      Not Used
< 8>    NC      Not Used
< 9>    NC      Not Used
<10>    NC      Not Used
<11>    NC      Not Used
<12>    NC      Not Used

<20> HUZ version         = PCHUZ 91     <21> HUZ address         = 1
<22> Group delay sensor  = 2            <23> Group delay mid     = 4
<50> Init sensors

<ESC> = Quit
Menu Option =
```

The header contains version, language, date, time and serial number of the SMC. The sensor parameters are displayed in tabular form under menu points 1..12. The parameters of the SMC then follow.

In order to alter a parameter, its menu number must be entered (e.g. 21 for SMC) and confirmed with Enter.

Exit from the menu by pressing the Escape key.

Sensor parameters

The parameters of the corresponding sensors are displayed in tabular form under menu points 1...12.

Version	Firmware version of the sensor ???? = Firmware version not known NC = Not Connected (no sensor connected)
Entrance	Entrance assigned
Reverse	Reverse setting (1 = switch direction In / Out)
Gain	Amplification
Counts In / Out	Threshold value for counting one person

If the parameter Not Used is displayed, the sensor is blocked.

If "Frame Error“ is displayed behind the parameters, the last communication with the sensor failed.

In order to alter the parameters of a sensor, the sensor no. (1..12) must be entered and confirmed with ENTER. The SMC now asks for the sensor parameters of the series.

Initialise sensors

Init Sensors starts the initialisation of all sensors connected. The firmware version of the sensors is requested. Then all ports where no sensor is connected are set to "Not Used“.

NOTE: ***If a sensor is set to Not Used, no sensor interrogation will be started on this port. Sensors connected subsequently will not be recognised!!!***
If the version number of a connected sensor is not read out correctly, communication with this sensor is disrupted (cable defective, sensor defective, plug connections, ...).

SMC parameters

There then follow the SMC parameters.

SMC version	the SMC2 version to be emulated (60, 61, 90, 91)
Address	the address of the SMC on the data bus
Group Delay Sensor	Group Delay Sensor
Group Delay Mid	Group Delay between sensors

5.3.7. Sensor measurements, control counting

The points described here should ensure that people are counted correctly. If it is not possible to keep to the limit values described here (e.g. due to disruptions) this should be documented in the setting/installation report.

The sensors are measured in the following sequence:

1. Set any existing fans, blowers, ... at the entrance to the standard setting (according to personnel). The setting should be documented in the setting report.

2. In **LiveMode** check that **no communication errors** occur with the sensor.

3. In **LiveMode** set the **amplification** so that

    - Amplitude remains < 10 when no person is crossing the sensor field.

    - When a person of average size crosses, 40..50 counts are measured.

    - When a person crosses, no counts are measured in the other direction. Example: one person crosses the sensor in the inward direction, but CountsOut are measured in addition to CountsIn.

4. By means of **Automatic Calibration** determine the threshold value for **CountsIn** / **CountsOut**.

5. Effect the paths defined below and adjust the counting parameters so that these are correctly counted.

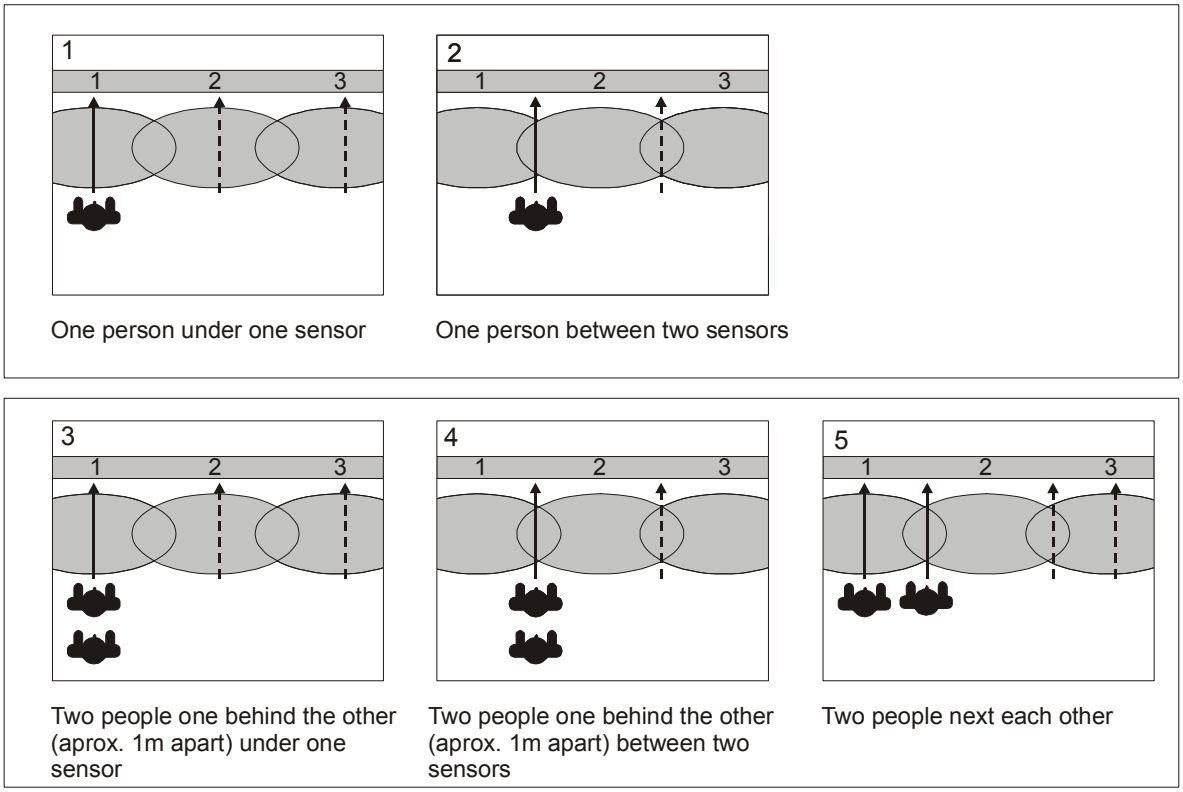


Fig. 5.4.7-1 Defined paths for adjusting the counting equipment

6. Carry out a **control count** (**ControlCounting**) and adjust the setting parameters (Gain, CountsIn, CountsOut) according to the count deviations. The way in which the control count is to be carried out is described below.

   - Increase threshold value for Counts if too many people are counted
   - Reduce threshold value for Counts if too few people are counted.

   The control count is carried out as many times as necessary to achieve this.

5.3.8. Agreeing control counts

In the control count, "**25 people / sensor**“ are counted.

Example: Entrance with 2 sensors ➔ control count to 25*2 = 50
Entrance with 4 sensors ➔ control count to 25*4 = 100

In the control count, only customers are counted (not in-house personnel). People are counted as follows:

- People under 1.40m are not counted (0 people)
- People with children / shopping trolleys count double (2 people)
- Wheelchair users count double (2 people)

If the entrance to be measured has low traffic (few customers), personnel should be included if possible. The way in which the control count is carried out should be documented in the installation instructions.

The control count has been achieved when the following criteria have been met:

- During the control count the count result of the SMC deviates from the actual value by fewer than 5 people.
- After the control count, the count result of the SMC deviates by less than 5% from the actual count.
- The count trend of the SMC is the same for both directions of counting (not that too man people are counted in but too few people are counted out).

5.3.9. Firmware update for the SMC

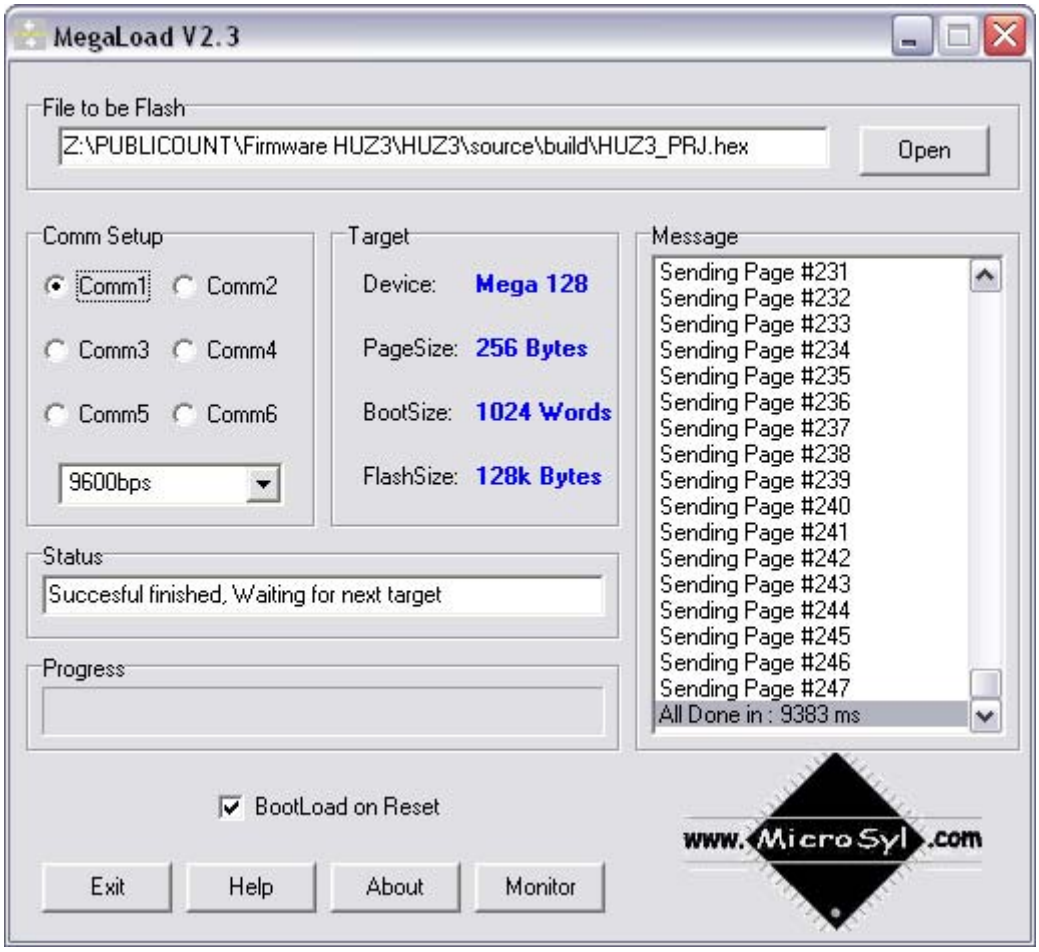
For the SMC3 Firmware Update, the "MegaLoad“ programme from the MicroSyl company (www.microsyl.com) is required.

The update can be done via RS232 or RS485 (Bluetooth is not supported). The cable connection should not be longer than 10m. The following baud rates are supported for this:

RS232	all baud rates
RS485	9600 baud

Update with 9600 baud

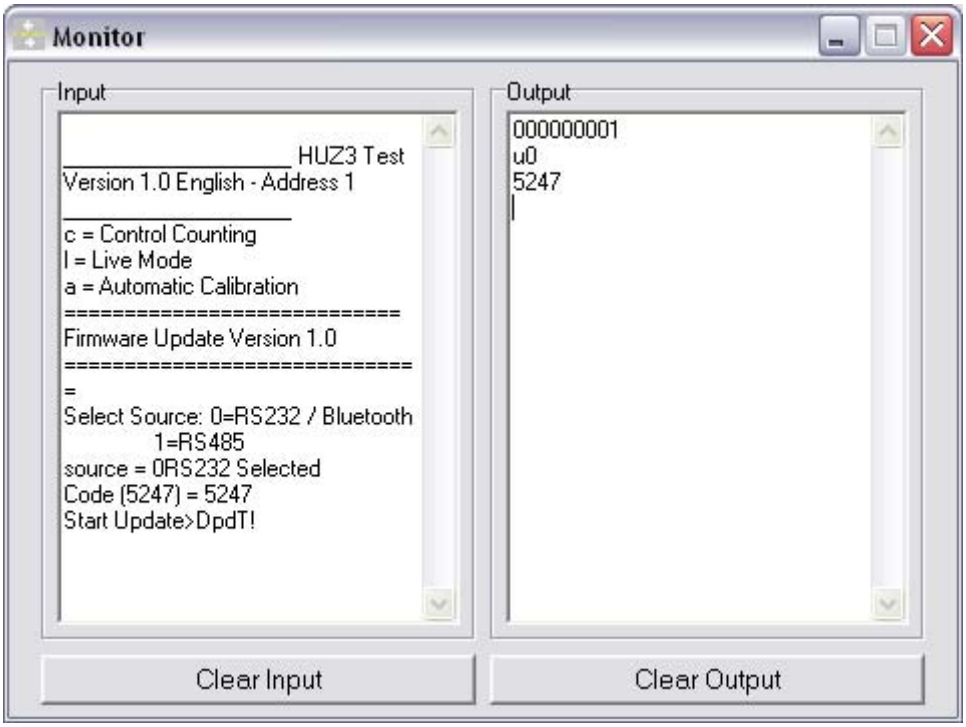
In order to carry out the update with 9600 baud, the MegaLoad programme only is required.



The new firmware (as a hex-file) is selected under Open.

The corresponding Comm Port, and 9600 bps, is selected under Comm Setup.

The " Monitor“ button is used for opening an Input-Output window. The SMC can be operated as on the terminal.



After activating the SMC (see 3.1.2), the Update Menu is opened by pressing key 'u'. The SMC then responds as follows:

```
================== Firmware Update Version 1.0 ====================

Select Source: 0=RS232 / Bluetooth
               1=RS485
source =
```

The source is requested here (RS232 / RS485). After entering the source and confirming this Enter, a security code (5247) is requested in order to confirm the execution of the update. After this code has been entered, the update is started.

With MegaLoad, progress is displayed under Message. With 9600 bauds, the update takes about 1 minute and has been successfully completed when "All Done in 87433ms“ is displayed under Message.

If the update is not to be carried out, this can be interrupted with ESC.

Newer versions of MegaLoad:

With newer versions of MegaLoad there are additional options in the form of check boxes. These must all be deleted!

Update with other baud rates

As the update takes quite a long time with 9600 bauds, an even higher baud rate can be used with an RS232 connection. For this, the terminal is required in addition to the "MegaLoad“ programme.

The baud rate for updating is selected under MegaLoad (e.g. 115200bps).

With 9600 bauds, the Update menu is called up in the terminal as described above and all inputs are carried out for starting the update.

After entering the security code 5247 and confirming this by Enter the connection to the terminal must be cut and restored by MegaLoad.

The update starts with the baud rate selected.

5.3.10. SMC Error Log

With HUZ2 versions 90 and 91 there is an error protocol which is also called up from PCSoft 6.2.

The file contains information on any errors which may have occurred with the SMC / sensors, and what these were. In addition the ErrorLog contains information on when the SMC was switched on.

The file structure will be described first of all, and then some examples are given of the possible entries.

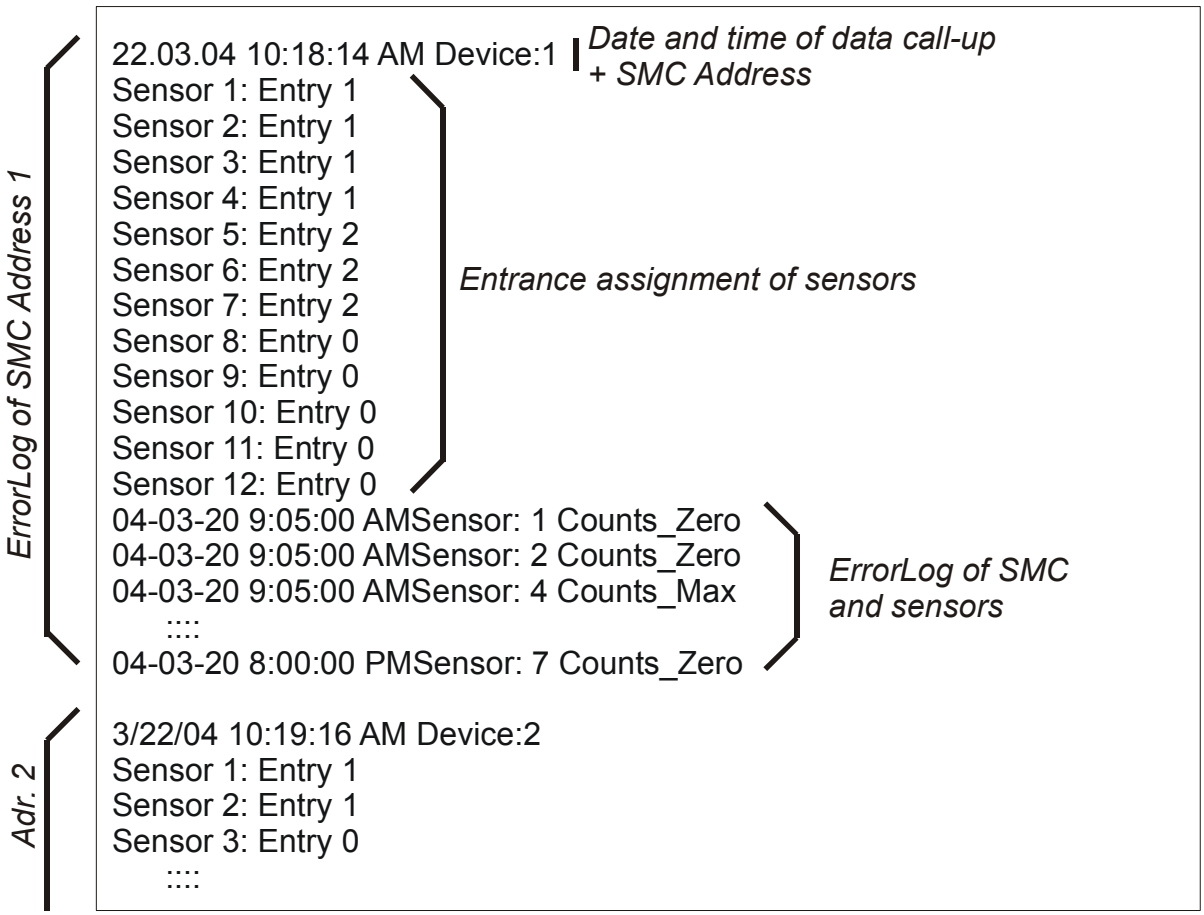
5.3.10.1. Memory location and name

File name: *#Date* lg.txt
e.g.: 04-03-25 lg.txt ErrorLog of 25 March 2004

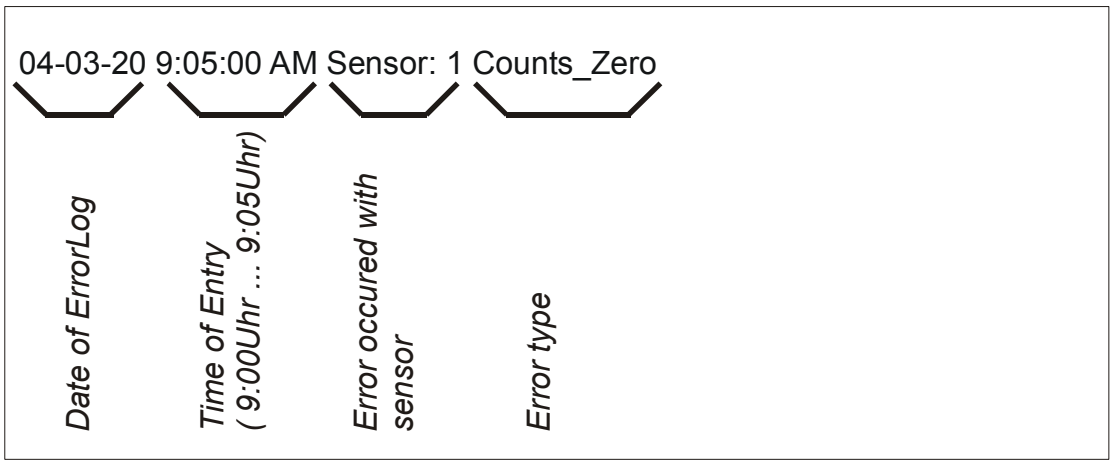
Memory location: In the location list (e.g. Direct)

The file can be opened e.g. with Editor (or Notepad) from Windows.

5.3.10.2. File structure



5.3.10.3. Structure of an entry



If no entry is included for a time, then no error occurred during this period.

5.3.10.4. Description of error types

Sensors	
Counts_Zero	The counts (in and out) of the sensor were always 0
Counts_Max	The counts (in and out) of the sensor were never 0
Ampl_Zero	The amplitude of the sensor was always 0
Ampl_Max	The amplitude of the sensor was always greater than 40
Comm_High >	There were communication errors with the sensor
Comm_Low >	(possible cable defect)

SMC	
Power_Off	The SMC was switched off continuously
Boot_Process	The SMC has been restarted
Date_Error	The date was not plausible (e.g. 34.12.2004)
Battery_Error	The battery is flat (these errors can be ignored)

ATTENTION: ***At sensor versions RN-SE2 the Counts_Max Errors are invalid.***

5.3.10.5. Examples

Example 1 – Error-free operation for the previous day

In the following ErrorLog dated 19.03.2004 (file name "04_03_19 lg.txt") no error occurred over the entire day. Data call-up was on 20.03.2004.

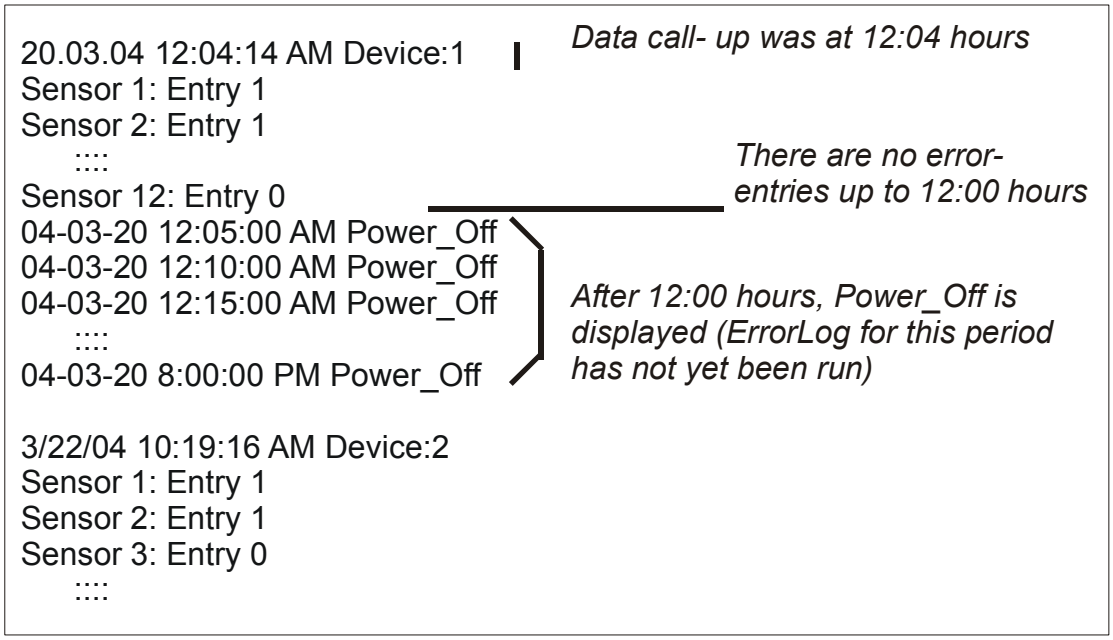
```
20.03.04 12:04:14 AM Device:1
Sensor 1: Entry 1
Sensor 2: Entry 1
     ::::
Sensor 12: Entry 0 ____________________ There are no entries

3/22/04 10:19:16 AM Device:2
Sensor 1: Entry 1
Sensor 2: Entry 1
Sensor 3: Entry 0
     ::::
```

As, apart from the entrance assignment, there are no entries, no errors occurred.

Example 2 – Error-free operation on the current day

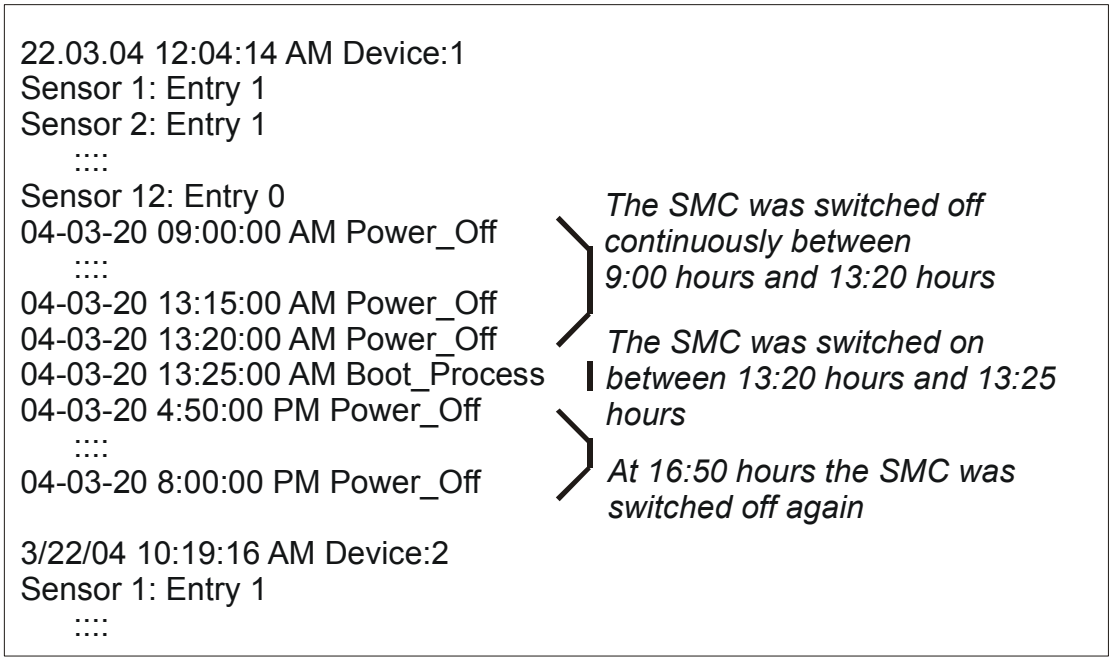
If the following ErrorLog for the current day (data call-up at 12:04 hours) no error has occurred.



As from 12:05 hours, Power_Off is displayed continuously as no value has yet been stored for these times.

Example 3 – SMC was not switched on continuously

In the following example for a previous day, the SMC was not continuously on.



Example 4 – Operational control of sensors during installation

The following examples show possible results of an operational control of the sensors between 11:00 hours and 11:15 hours.

Before 11:01 the sensors were automatically measured, when the SMC did not store the ErrorLog. "Power_Off“ is displayed at this point in the file.

```
20.03.04 11:16:14 AM Device:1
Sensor 1: Entry 1
Sensor 2: Entry 1
     ::::
Sensor 12: Entry 0
     ::::
04-03-20 11:00:00 AM Power_Off
04-03-20 11:05:00 AM Sensor: 4 Counts_Max
04-03-20 11:10:00 AM Sensor: 4 Counts_Max
04-03-20 11:15:00 AM Sensor: 4 Counts_Max
04-03-20 11:20:00 AM Power_Off
     ::::
04-03-20 8:00:00 PM Power_Off
```

There are error entries for sensor 4

Sensor 4 is defective (produces continuous counts)

```
20.03.04 12:04:14 AM Device:1
Sensor 1: Entry 1
Sensor 2: Entry 1
     ::::
Sensor 12: Entry 0
     ::::
04-03-20 11:00:00 AM Power_Off
04-03-20 11:20:00 AM Power_Off
     ::::
04-03-20 8:00:00 PM Power_Off
```

There are no error entries for the test period 11:05 hours to 11:15 hours

In the period 11:05 hours...11:15 no errors occurred (there is no entry).

5.3.11 Trouble Shooting

Bluetooth module does not respond on the PC

Reset the Bluetooth module (“`at&f`”). The module should respond after approx. 5s with “`OK`“.

SMC can not be selected via the terminal

Terminal setting correct? Connection OK?
SMC responds after a Reset.
If not -> check cable / Bluetooth, terminal settings

Symbol repeat rate = High, Delay = Short ?
Check in system control

The sensor version is not correctly recognised with InitSensors.

The firmware version of the sensor is only displayed as from KF23.1.

Cable connection to sensor OK?
Shielding applied on one side to the SMC
Plug connection (RJ45) ok
The sensor is isolated

Sensor OK?
Make a direct connection between terminal and sensor and press 'x' a number of times. The sensor outputs its version number (e.g. KF32.3). If not, the sensor may be defective.

Also refer to the known errors listed in the Appendix.

6. Operating the sensors – Version KF32.x

Sensors version KF32.x are required for the SMC3 version 1.x. The sensors measure the amplitude, as well as the counts, and send their measurement data to the SMC.

The sensors support an auto-test and a firmware update. For this, as shown in the following illustration, the sensors must be connected to the PC.

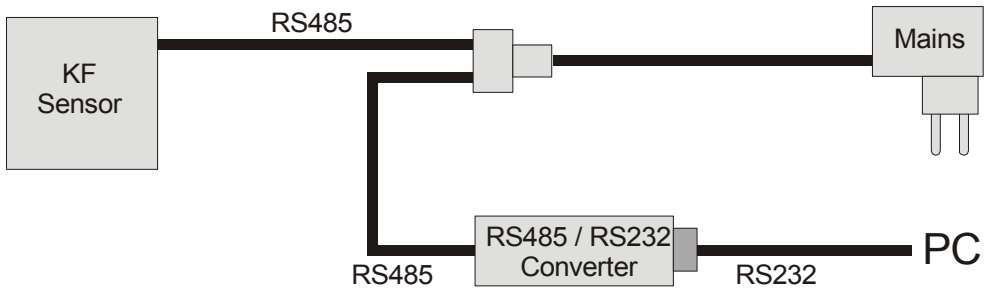


Fig. 6-1 Connection of a sensor to the PC

The sensors are operated via the terminal (9600 Baud).

6.1. Version info on KF sensors

After pressing key '**x**' a number of times, the sensor issues its firmware version:

Sensor output text	**Firmware version**	**Particular features**
Bootload: Code (5247)	KF32boot	Bootloader*
KF-Sensor 32.2 Boot u = Firmware Update s = Selbsttest	KF32_2boot	Bootloader* Auto-test
KF-Sensor 32.3 Boot u = Firmware Update s = Selbsttest	KF32_3boot	Bootloader* Auto-test Error suppression (retail mats)

*The Bootloader makes firmware updating possible

6.2. Auto-test

As from sensor version KF32.2, auto-testing of the sensor is possible. This auto-test measures the noise level of the radar module for approx. 20s and issues the measurement result. The auto-test is carried out as follows:

1. As the auto-test measures the noise level for approx. 20s, the sensor field must be free of movements during the measurement. For this, the sensor is laid, with the antenna, on a vibration-free surface (e.g. on the floor).

2. As with the firmware update, connect the sensor direct to the PC and start the terminal.

3. Press 'x' approx. 6 times in succession. The sensor responds with

   ```
   KF-Sensor 32.3 Boot
        u = Firmware Update
        s = Selbsttest
   ```

4. The auto-test is started by pressing the ’s’ key. The following appears

   ```
   === Start Selbsttest ===....
   ```

   on the screen. The dots shown progress.

5. After approx. 20s the sensor gives, e.g., the following measurement result:

   ```
   CH1: max=523 , min=502 , diff=21 , avr=512
   CH2: max=542 , min=476 , diff=66 , avr=503
   Modul OK
   ```

   The top line shows the measurement data from channel 1, the bottom line from channel 2 of the radar module. Max/ Min is the highest/lowest value measured, Diff if the difference and Avr the average value measured.

   The auto-test is complete when

   ```
          CH1   Diff < 28
   and    CH2   Diff < 75
   ```

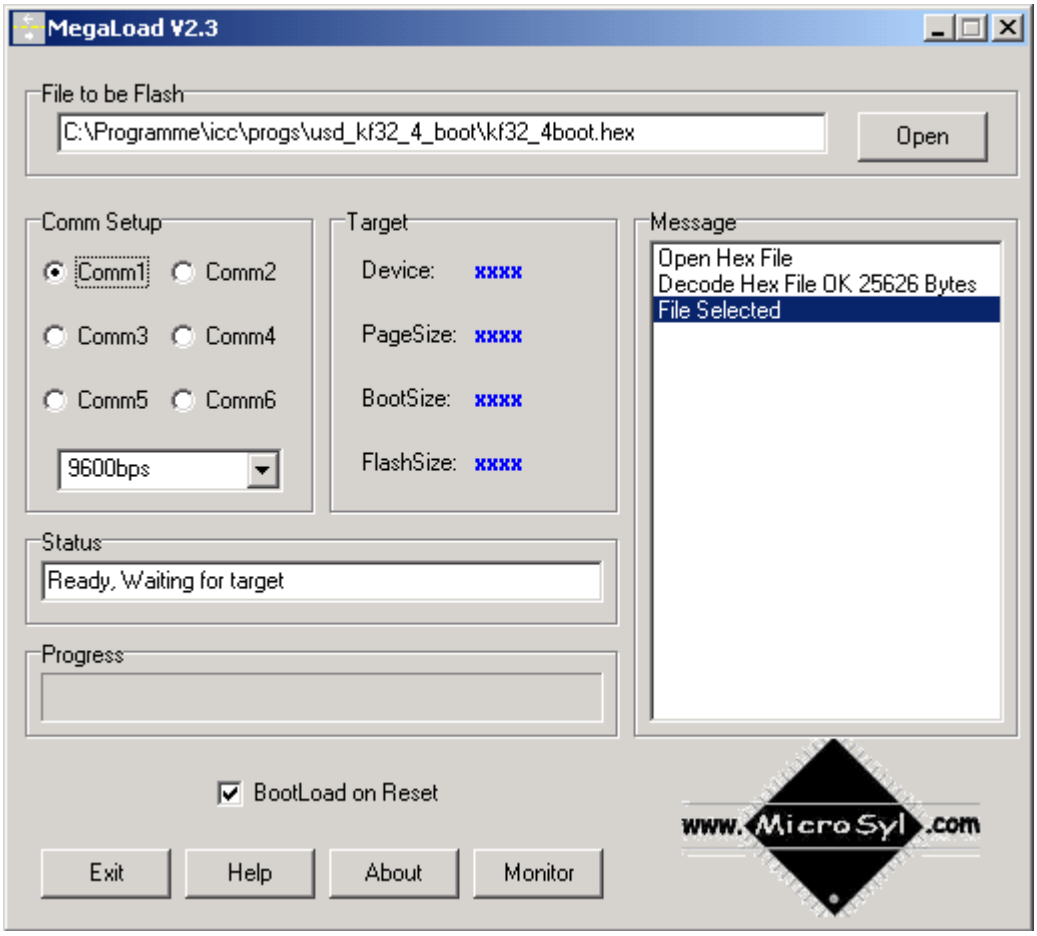
   In the example, "Module OK" is output in the bottom line.

6.3. Firmware Update

The following stages must be followed for the firmware update of a KF sensor:

1. Connect the sensor direct to the PC

2. As with the firmware update for the SMC, the **MegaLoad** programme is required.



   - Under ***Open*** select the new firmware (in the example „kf32_4boot.hex)
   - Under ***Comm Setup*** select the corresponding Comm Port, and ***Baud rate 9600bps***
3. When the Monitor is pressed, another window appears via which communication with the sensor can be established.

4. Press **"x"** approximately 6 times is succession (see following illustration)
   - the following appears

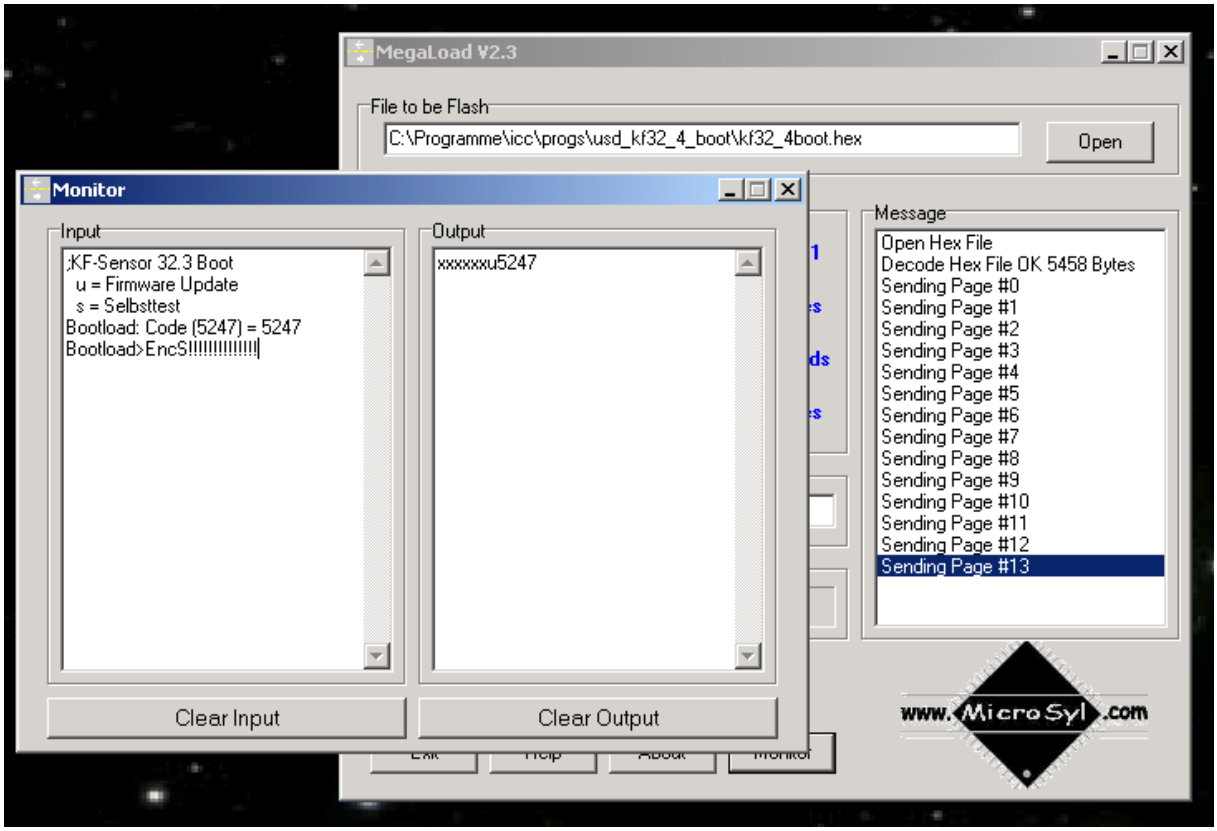
     ```
     KF-Sensor 32.3 Boot
           u = Firmware Update
           s = Selbsttest
     ```

     on the screen

5. Select the firmware update by pressing **"u"**

- the following appears
  `Bootload: Code(5247)`
  on the screen

6. The firmware update is started by entering the code displayed (**5247**) and confirming it with **ENTER**



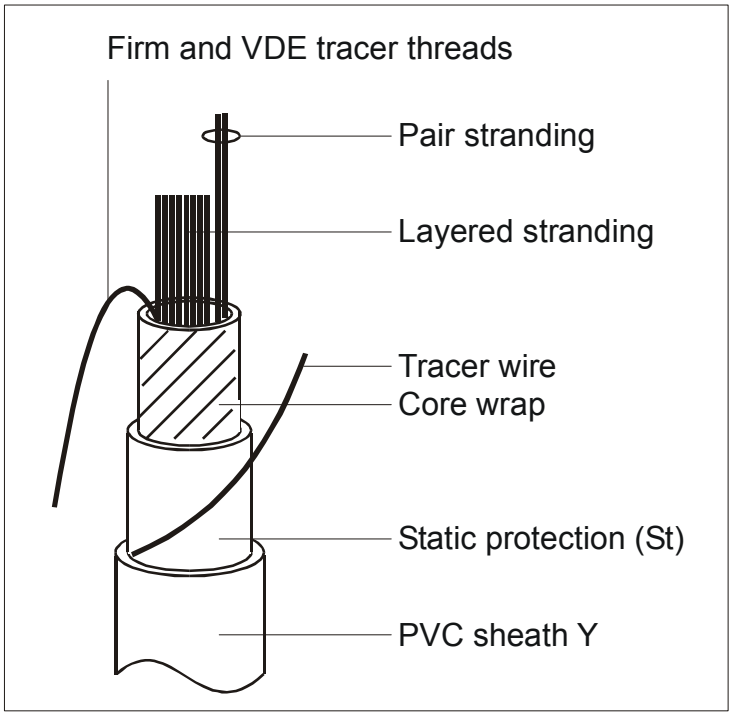
The progress of the update is displayed under Message. When the update is complete, **"All Done in 6799ms"** is displayed.

Appendix

A1 - Separating an installation cable

Structure (I-Y(St)Y)

The installation cable used in communications and security technology consists of a PVC sheath. Beneath this there is a metallic plastic shield providing static protection and a plastic core wrap. Between these is the tracer wire which is connected to ground. Underneath are the double conductors (pair stranding) which are arranged in layered stranding.



When the installation cable is to be used, the sheath, the static protection and the core wrap must be removed. A knife is used for this. Care must be taken here to ensure that the tracer wire is not broken and the double conductors are not damaged. When removing the sheath it is important that the core does not come apart. It is best if the core is held together with a cable tie or wire. When separating, the double conductors are twisted together and grouped into bundles (5 double conductors in each).

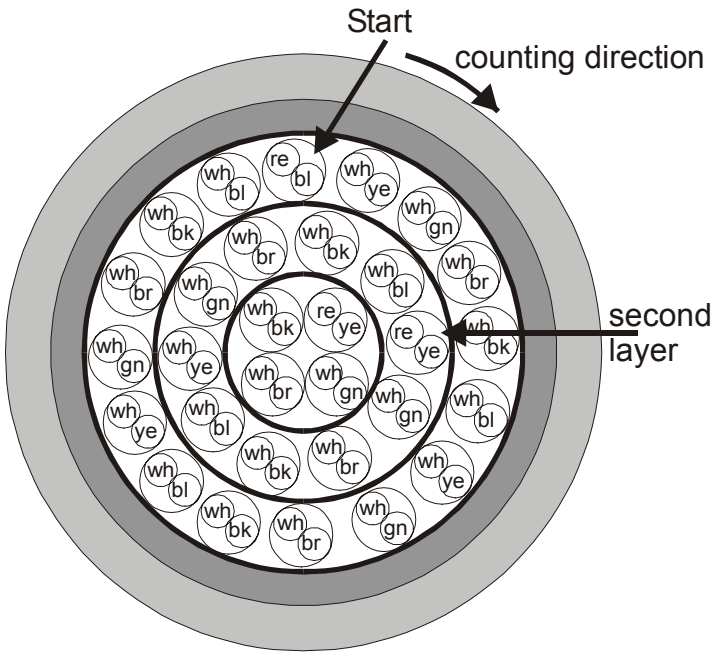
Separating

The counting direction / colour coding is

blue – yellow – green – brown – black

Each conductor pair consists of 2 twisted conductors. The colour of the first core is white, the second is one of the colours above. If the conductor pair represents the start of a layer, the colour of the first conductor is red.

The first conductor pair is red-blue. The next colour is yellow. Because the conductor pair is next to the first pair (red-blue) on the right side, the counting direction is known and the first layer can be separated.



Example: Layer 1: red-blue , white-yellow , white-green , … , white-blue

In the example the first layer ends with white-blue. So the next layer begins with red-yellow, followed by white-green. So the counting direction is known again and the second layer can be separated.

The following table gives an overview for different installation cables.

Double conductor	a-core (base colour)	b-core (identification)	Comments, tips
Installation cable with 2 double conductors (2x2)			
1.	red	black	The 2x2 cable is an exception in the core colours.
2.	white	yellow	
Installation cable with 4 double conductors (4x2)			
1.	red	blue	
2.	white	yellow	
3.	white	green	
4.	white	brown	
Installation cable with 6 double conductors (6x2)			
1.	red	blue	1st bundle/double conductor bundle
2.	white	yellow	
3.	white	green	
4.	white	brown	
5.	white	black	
6.	white	blue	2nd bundle
Installation cable with 10 double conductors (10x2)			
1.	red	blue	1st bundle/1st layer/ double conductor bundle
2.	white	yellow	
3.	white	green	
4.	white	brown	
5.	white	black	
6.	white	blue	2nd bundle
7.	white	yellow	double conductor bundle
8.	white	green	
9.	red	brown	2nd layer
10.	white	black	

A2 – Suitable installation cable for Publicount installations

The following installation cables (from these manufacture) are suitable for Publicount installations. The criteria for these cables are

- flexible
- twisted
- shield

A3 - Known errors with the SMC firmware

A3.1 –SMC Version 1.1

Operator output changeover changes from RS232 to RS485

With the SMC, the RS232 and RS485 interfaces are independent of each other. If the SMC is activated via RS232, then this also responds on the RS232 line only (there is no data output on the RS485 interface).

With Version 1.1. it is possible, due to a fault on the RS485 line, data call-up by the PC, that output is switched to the RS485 port. This has the following effects on the user side:

- In ControlCounting, the SMC does not appear to continue counting
- In LiveMode, there is no further data output
- The SMC does not appear to be reacting any more

Output is switched back to the RS232 interface by pressing any key (e.g. Esc).

In the configuration menu, Entrance=241 is displayed for one sensor

According to InitSensors in the configuration menu, Entrance=241 is set for the ports used (no sensor connected), in order to identify this for PC data call-up.

If a sensor is added, Entrance must be set to the new value manually.

Entry=241 is displayed in the ErrorLog

This value is the equivalent of Entrance=0, meaning no sensor connected.

Errors are displayed in the ErrorLog for unused ports

These errors can be ignored.

A4. Optional: Connection via Bluetooth

Using Bluetooth a *wireless connection* to the SMC is possible during the configuration and parameter setting phase of the counting equipment. This means that the expensive RS232 cabling, which can be a nuisance for the client, can be dispensed with.

The Bluetooth modules used with Publicount have a maximum *breadth of range* of 100m in the open (Class 1). In real installations, when the SMC is installed behind walls, cover plates etc., the remaining breadth of range is around 30..50m.

A Bluetooth adapter is required for each SMC, as well as one for the service PC (Notebook) locally. From the PC outwards, a cable-free connection arrangement to each SMC is then possible.

Once a Bluetooth connection has been set up between PC and SMC, the PC and SMC behave as they would if connected together by an RS232 line (*cable back-up*). However, *setting up* a Bluetooth connection does require a few stages, which will be illustrated below.

A4.1. Producing the connection to the SMC

1. Setting up the SMC for Bluetooth:
   Disconnect the SMC. Plug the Bluetooth module into the RS232 port and connect it up again (mains cable). The module is recognised by the SMC immediately it is switched back on and configured. Plugging in the module with the equipment running is not permissible.

2. Setting up the PC:
   Connect the Bluetooth adapter to the USB or serial interface (RS232) and start the "Hyper-Terminal“ programme. The Bluetooth module should respond with an "`OK` " message.

3. Interrogation of existing Bluetooth equipment:
   In order to be able to set up a Bluetooth connection, you need to know what other Bluetooth equipment is located within this environment. The command “`at+btinq?`“ is used for this. The PC module may respond with the following outputs:

   ```
   000B5316118C,HUZ-3,001F00

   000B53160DB0,HUZ-3,001F00

   000B53160EF8,HUZ-3,001F00
   ```

   The response means that 3 Bluetooth SMCs are located in the immediate vicinity. The first 12 digits here represent the Bluetooth module address by means of which access to the relevant SMC is possible.

4. Entering the password, making the connection :
   The Bluetooth connections used by Publicount for the SMC are coded for security reasons and provided with a password. Setting up a connection between PC and SMC is only possible if the password and Bluetooth address of each SMC are known.

   The following example of a sequence produces just one Bluetooth connection to an SMC:

   ```
   at+btkey=”HUZ3-0408-001”
   atd 000B5316118C
   ```

   The first command sets the password on the PC side. It is identical to the serial number of the relevant SMC and has the format <HUZ3-mmyy-number> (example: “HUZ3-0408-001“). The second attempts to set up the connection between PC and SMC. The PC module should respond with “OK“ to both commands. If the connection is made, the module then issues the message “CONNECT 000B5316118C“, or otherwise “ERROR“.

The connection to the SMC has now been made.

A4.2. Other commands

Break connection:
Once made, a connection can be broken again with the following command sequence:

```
+++
ath
```

The PC module should respond with “OK“ to both commands. If the connection is then finally broken, “DISCONNECT“ should then be set. The PC module is now free for a new Bluetooth connection.

Restore last connection:
With the command “atd“ the last connection used is restored. All connection data remain in existence, even after the Bluetooth module has been switched off.

Reset the PC module
The PC module can be reset by means of the command "at&f". After resetting, the module again responds with “OK“. If the Bluetooth module does not send a message to the PC, a Reset must be carried out.